



SUMMARY OF THE INVENTION

It is an object of this invention to provide an improved surveillance system.

It is a further object to provide an asynchronous surveillance system.

A surveillance system for reviewing transaction events which occur at one or more check outs or operation stations is disclosed. Light recordings, (i.e., anything that records light/images including video and television cameras) are made of transaction events occurring at a point-of-sale terminal or other operation station. A video camera or the like generates video signals corresponding to the behavioral events occurring at the terminal. A sensor means at the operation station generates digital signals representing the transaction events occurring at the terminal. The sensor means can be a cash register, a toll booth register, a machine that automatically receives money at toll plazas, or machines that can read a bar code printed on an item (bar code scanners). A means for generating a synchronizing signal (usually from an independent clock or from the point-of-sale terminal's clock) is required.

A first recording means synchronously stores the digital signals from the sensor means including any operation station identifier, time, date, camera

identification and data source identification with the video signals generated by the video camera. The first recording means must also store the synchronizing signal. The digital signals are stored separately on the video tape so as not to degrade either the digital signals or the video signals.

A second recording means stores the digital signals along with all other event or transaction data. The second recording means also stores the synchronizing signals.

A playback means retrieves the information saved by the two storage devices; i.e., the video signals and the digital signals from the first recording means and the digital signals from the second recording means. If the first and second recording means use different storage media, two different playback means may be required. A control means, responsive to an input signal (usually from an operator at a computer), generates a composite video signal. The composite video signal includes signals representing alphanumeric displays of the transaction data corresponding to the desired behavioral events. The control means synchronizes the digital data from the second recording means with the composite video signal by comparing the synchronizing through the signals stored by both recording means. The synchronizing signals can be an independently generated timing signal, transaction sequence number or any other identifying media. Finally, a monitor is used to display the composite video signal.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects of the present invention and the various features and details of the operation and construction thereof are hereinafter more fully set forth with reference to the accompanying drawings, where:

Fig. 1 is a schematic block diagram of a surveillance and transaction recording system in accordance with the instant invention.

Fig. 2 is a schematic block diagram of an alternative system for receiving time synchronization information for use in a surveillance system in accordance with the present invention.

Fig. 3 is a schematic block diagram of an alternative system for recording the behavioral events in accordance with the present invention.

Fig. 4 is a schematic block diagram of a system for recording transactions continuously for an extended period of time.

Fig. 5 is a schematic block diagram of an alternative system for recording transactions from a plurality of transaction lanes continuously for an extended period of time.

Fig. 6 is a schematic block diagram of the interface configuration.

Fig. 7 is a block diagram of an alternative configuration of the interface.

5 Fig. 8 is a block diagram of an alternative system for recording transactions for an extended period of time which may be used with the system shown in Fig. 3.

Fig. 9 is a block diagram of the instant invention using a common time source.

10 Fig. 10 is a block diagram of an alternative system using a common time source.

Fig. 11 is a block diagram of a second alternative system using a common time source.

15 Fig. 12 is a replay station used to review the transactions.

Fig. 13 is a schematic block diagram of a surveillance and transaction recording system for use with multiple point-of-sale terminals in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

5 The format of transmitting and storing transaction information used by manufacturers of cash registers and other data entry terminals is extremely diverse. Some systems immediately transmit the transaction data to a host computer after every item is "rung up" or scanned. Previous surveillance systems would tap into the wires or bus connecting the cash register to the host computer, and record the transaction data contemporaneously with the behavioral events recorded by a television camera. One of the more advanced surveillance systems of this type was disclosed in U.S. Application No. 07/629,255, filed December 18, 1990, which issued on June 1, 1993, as U.S. Patent No. 5,216,502. U.S. Application No. 07/629,255, now U.S. Patent 15 5,216,502 is incorporated by reference as if fully set forth herein.

Fig. 1 is a block diagram of the preferred embodiment of the recording portion of the Asynchronous Video Event and Transaction Data Multiplexing (AVETDM) surveillance/recording system in accordance with the present invention. The surveillance system can be used in different environments such as a retail environment (grocery stores, convenience stores, music/specialty stores, etc.), automotive vehicle toll booths employed at turnpikes, tunnels and bridges, and electronic guard tours. It is especially well suited for point-of-sale terminals which

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delay the transmission of the transaction information until the completion of a customer transaction or after several customer transactions.

5 In applications where the transaction data is sent to a host at the conclusion of the transaction, i.e. when the total amount due is calculated upon the depression of a tender key, or when the sale to an individual customer is consummated, the transaction information with respect to
10 individual items is bundled or packaged. This bundle is then sent to the appropriate storage device (e.g. a host computer) after the entire transaction is completed. For example, one system sends the data in 128 byte packets when the tender key is depressed.

15 The recording system of the present invention can generally be indicated at 10. The transaction events occur at a point-of-sale (POS) station or terminal 12. For example, the POS 12 can be an automatic teller machine, cash register, toll booth or other system. The transaction
20 information is stored in a transaction database 14. The transaction database 14 can be a computer with the information stored on a magnetic medium. A camera 16 is positioned so that it can view the customer's behavior at at least one POS 12. The AVETDM requires a synchronizing
25 signal. In the preferred embodiment, the Synchronizing signal is generated by a common time source 18 which provides the synchronizing information for the transaction

database 14 and an interface 20. The common time source can be as independent clock, e.g. a clock synchronized with the atomic clock of the National Institute of Standards and Technology (NIST). Alternatively, the recording system can use the clock of the POS 12.

The interface 20 receives a synchronizing signal from the common time source and converts it to a form that can be recorded with the video signals from camera 16. The interface 20 may also place some static data on the recording to describe the store location, camera number/position or other indicia.

Recording device 22 records the video signal from camera 16 and the coded data signals (including the synchronizing signal) from the interface 20. The recording device 22 may be a video cassette recorder, video disc, or a computer-based video capture system. The present system may have more than one recording device 22. Typically, one recorder 22 is required for each camera. However, some camera systems use various video combining and multiplexing technics to allow a single recording device 22 to record information from multiple cameras.

The recording device 22 records the information from the interface in such a manner as to preserve the entire video signal generated by camera 16. For instance, if the recording device 22 is a video cassette recorder, the video

signals are stored on the video portion of the video tape, while the coded data signals from interface 20 may be recorded on the audio portion of the video tape.

5 An alternative recording system 11 of the AVETDM system is shown in Fig. 2. Like devices are similarly numbered. In Fig. 2, the point-of-sale system 13 generates its own synchronizing signal which is input into the interface 20 and the transaction database 14. Preferably, the synchronizing signal is a timing signal from an internal clock. However, sequencing information or other data may be used. The POS generated signal is used to synchronize the video or behavior information stored on recording device 22 with the transaction information stored on transaction database 14. In this alternative embodiment, a separate independent synchronizing source is not required.

Referring now to Fig. 3, a second alternative recording system 15 is shown. Again, like elements are similarly numbered. In this embodiment, the interface 21 combines the video signal from camera 16 and the synchronizing data signal generated by the POS 13 into a combined video/data signal. The recording device 22 records the combined video/data signal. It is preferable that the interface 21 combines the video and data information in such a manner that all of the information is preserved. The transaction database 14 stores all of the transaction data along with the synchronizing signal from POS 13.

Referring now to Fig. 4, an embodiment is disclosed which allows twenty-four hour coverage of the POS station for an extended period of time. In this situation, the recording device of choice is a VCR 26. Each VCR 26 can
5 record eight hours of behavioral events occurring at the POS. Therefore, a bank of three VCRs can provide twenty-four hour coverage. Splitters or T's 28 split the video signal from lines 100, 102 and 104 from the cameras. If the data from the interface is stored on the audio channel,
10 similar T's 28 may be used to input the synchronizing or data signal to all VCRs 26 from line 106. The embodiment disclosed in Fig. 4 can be used with the recording system shown in Fig. 1 or Fig. 2.

15 In Fig. 5, a schematic diagram of an alternate recording system using a plurality of interfaces is shown.

The preferred configuration of the interface 20 is shown in Fig. 6. A configuration terminal 32 or other controlling system is connected to a microprocessor 30. The synchronizing data, e.g. timing information, enters the
20 microprocessor 30 at input 40. The outputs 107, 109 and 111 of the microprocessor 30 are connected to various data encoders 34, 35...M. The type of data encoders 34, 35 used, depends on the recorder 22. For example, if the recorder 22 is a VCR, the data encoder may be a Data Based Security AM
25 90.

Fig. 7 shows an alternate interface circuit 21, which is used in connection with the alternate recording system as shown in Fig. 3. Again, the configuration terminal or other controlling system 32 is connected to the microprocessor 30 via line 42. The raw data, including the synchronizing data, coming from the POS 13 is input at 40 to the microprocessor 30. The outputs 107, 109 and 111 of the microprocessors 30 are connected to the encoders 44, 45....N. The video signal from the camera 16 is also input into the encoder at 50. The inputs may all be from one camera (in which case 50a, 50b and 50n are connected by splitters or T's) or alternatively each video input 50 may be connected to an individual camera. The encoders 44, 45....N produce an encoded combination of the video and data. Again, this encoded information is generated in such a way that the entire data information and video information are not degraded. The outputs 114, 116 and 118 of the encoders are connected to the input of a recording device 22. For example, if the recording device used is a VCR, the arrangement as shown in Fig. 8 may be used.

Fig. 8 shows an alternative embodiment which will allow an extended time coverage of the POS stations for use with the system shown in Figs. 3 and 7. In this case, the behavior data generated by camera 16 is combined with the transaction data before recording on VCR 23. Splitters 28 direct the combined signal from the interface to each bank of VCRs.

Referring now to Fig. 9, an independent time source, as may be used in the system of Fig. 1, is shown. In this example, the time source 61 is the atomic clock supported by the National Institute of Standards and Technology. The time source 61 generates a real time signal. The time source 61 is connected to an antenna 62, which transmits, via wireless technology, the time signal. Receiving antennas 64 amplify the received timing signal and forwards the timing signal to a time receiving box 66. The time receiving boxes 66 condition the timing signal in manner that the POS 13 and the interface 20 can better utilize the timing signal. A serial interface (not shown) may be used to connect the time receiving boxes to the POS 12 and the interface 20. In this manner, the transaction database 14 and the recording mechanism 22 store the exact time simultaneously. Upon playback of the transaction data and the recording medium, the timing signal will be used to synchronize the transaction information with the behavioral information.

In Fig. 10, an alternative common time source is shown. In this system, a master time receiver 70 is connected to receive antenna 64. The output 71 of the master time receiver 70 is connected to a plurality of slave time receivers 72. The slave time receivers 72 are connected to the POS 12 and the interface 20. Again, the transaction database 14 and the recording mechanism 22 record the exact

time which can be used to synchronize the data during playback.

Fig. 11 is a second alternative common time source circuit. The time source 61 is connected to a modem 74. The modem 74 is connected in the usual manner via telephone lines to a public telephone network 76. The surveillance system also has modems 78 and 79 which are connected to the public telephone network 76. The modem 78 and 79 are connected to the POS 12 and the interface 20 respectively.

The AVETDM playback system is shown in Fig. 12. The transaction database 14 is connected to a compatible transaction database 80. Compatible transaction database 80 converts the transaction information and the synchronizing signal stored on the transaction database 14 during the recording period into a compatible format. The compatible transaction database 80 is connected to a microprocessor 82. The microprocessor controller 84 is directly connected to the microprocessor 82. In the preferred embodiment, the controller 84 and the microprocessor 82 are an off-the-shelf computer, for example, an IBM compatible 486 computer. In this case, the controller 84 is the terminal and keyboard of the computer.

All of the transaction data is downloaded into a database the microprocessor 82. This information is then accessed by the microprocessor 82 at the appropriate time.

An alternate system (not shown) can have the microprocessor 82 controlling the transaction database 14 to download the data when needed.

5 An output of the microprocessor 82 is connected to a playback mechanism 86. The playback mechanism 86 must be compatible to the format of the behavioral information stored by the recording medium 22. For example, if the recording medium 22 is a VCR, the playback mechanism 26 will be a VCR also. The output of the playback mechanism 86 is
10 connected to a decoder 88. The decoder 88 decodes the synchronizing data from the playback device 86. An output of the decoder 88 is fed to the microprocessor 82.

15 The microprocessor 82 using the synchronizing signal, e.g. the timing signal which was stored by the transaction database 14 and the recording medium 22, synchronizes the behavioral/video information with the transaction data. The microprocessor 82 outputs a video overlay signal to an overlay control box 90 via line 140. The stored video signal from camera 16 is reconstituted by the playback
20 medium 86. The video signal contains the behavioral events which occurred at the POS 12, e.g. a person purchasing their groceries or a truck paying a toll. The video signal is input to the overlay control box 90 via line 142. The overlay control box 90 produces a composite signal which
25 includes the behavioral information being overlaid with the

preferred transaction data. The composite signal is displayed on monitor 92.

5 The operator at controller 84 decides which behavioral events and which transaction events to view. The operator may have a menu of events to choose. For example, the operator may wish to view the events at cashier number five. The microprocessor 82 controls the playback device 86 to output the video signals corresponding to cashier number five. Normally, all of the transaction data is downloaded
10 into the microprocessor 82. The transaction events which correspond to the transactions at cashier number five are then recalled. The microprocessor then outputs the appropriate data to the overlay control box 90.

15 The microprocessor has both synchronizing signals, which were stored during the recording session (see Fig. 1), available to process. That is the synchronizing data stored by the transaction database 14, and the synchronizing data stored by the recording mechanism 22 are both input to the microprocessor 82. Therefore, the microprocessor 82 matches
20 up or synchronizes the behavioral events (video information) with the asynchronously stored transaction events.

25 Since the microprocessor 82 has available to it all of the transaction data recorded onto the transaction database 14, it is possible for the operator to look into the "future". For example, the operator may wish to look at all

transactions at cashier number five in which a customer uses a credit card. The operator can direct the microprocessor 82 to look for the credit card transactions. Therefore, while the playback device 86 is showing behavioral events taking place at the "present" time, the microprocessor 82 can inform the operator that a credit card transaction will take place in twelve minutes and thirty-one seconds (or alternatively, the eighth customer from now will use a credit card).

The instant surveillance system records on the video images (behavioral events) as they transpire. The transaction data packet is stored on the video tape and is also stored by a second recording device, preferably, the record recording device is computer compatible, e.g. computer hard drive, floppy disk, CD Rom, etc. It should be noted that the transaction data may also be stored with the video images. The surveillance system allows the operator to freeze the data display in the overlay while the video tape is rewound to the beginning of the transaction. The operator can then review the behavioral events while looking at the transaction data in the overlay.

Line markers are provided on the overlay to enable the user to move a pointer on the overlay to each item as it is registered by the clerk in the picture. The system encodes the next transaction serial number on the sound track of the video tape at the end of each transaction. Alternatively,

an independent clock can be used to synchronize the data stored on video tape with the data stored in the second medium. The user can use the serial number to be certain that the transaction behavior that he is seeing corresponds to the transaction data in the data overlay.

Referring now to Fig. 13, the surveillance system according to the present invention is shown in which there are multiple cameras and multiple point-of-sale terminals. Each camera 126, 127, 128... can be situated to cover one point-of-sale terminal 112, 113, 114..., or one camera may be situated to cover multiple point-of-sale terminals. The point-of-sale host 116 can provide the timing for the entire surveillance system. However, as described previously, a common time source 130 is preferred. The interface 132 operates in a similar manner as the interface described in Fig. 1. Similarly, the recorders 134, 135, 136... also operate in a similar manner as the recorder 22 described in Fig. 1.

In some point-of-sale systems, the transaction data is stored after the transaction termination time, e.g. some POS systems buffer several transactions before transmission to the host. Therefore, the transaction events cannot be stored simultaneously with the behavioral events.

In certain toll systems, the toll transaction data is stored in a lane controller. The transaction information

may come from a toll terminal, card reader, loop detector, treadle, indicator light, etc. located in each toll lane. After the data is stored in the lane controller, it is sent to the plaza controller at irregular intervals. Several transactions take place between data transmissions. For example, five vehicles may have to exit the lane before a transaction is transmitted to the host computer. If several transactions occur before the data is transmitted, there is no method of synchronizing the transaction data with the video images other than the data freeze or data pause method. However, the data pause method is not acceptable to toll authorities, since it requires too much time to review tapes and does not work well with automated tape editing. The solution is to develop circuitry which inputs synchronizing data, encodes it, and stores it along with the video signal. The synchronizing data may be stored on the video tape's sound track, the video tape's vertical interval or within the visible video. The transaction data is stored asynchronously from the behavioral events. However, the transaction data is also stored with the synchronizing signal in a manner that supports synchronizing or re-synchronizing the recorded behavior with the transaction data upon playback.

The AVETDM computer encodes the video tape with identifying indicia, including facility name/number, camera identification, date and time messages. The time messages can be inserted every 100 milliseconds. The AVETDM

simultaneously captures the transaction data from the lane controller. These messages include several transactions. Each transaction includes time messages for that transaction. Each transaction message can be stored in a file with the date, lane, terminal identification, etc., and the time.

The file will contain a list of messages indexed by date, time, lane, etc. Upon replay, the user selects the target lane. When the video tape is replayed, the AVETDM inputs the data and time messages. The AVETDM requires the time messages from the tape and looks up the messages in a data file on the disk for that time and target lane. The AVETDM then displays the messages from the targeted lane and the data overlay. In one embodiment, the lane controller stores three transactions and forwards all three at the end of the third transaction to a host computer.

A camera is placed at the toll plaza to view four to six lanes from the exit side. A video tape recorder, for example a VHS video cassette recorder, is connected to each camera. The AVETDM computer is connected to the lane controller communication so that the AVETDM computer receives all of the data messages that are communicated between the lane controller and the plaza computer. The VHS tape is encoded with data messages that identify the plaza and the date. Time messages are encoded every 100 milliseconds. The plaza number, lane number, date and time

are stored to the host computer's disk for every transaction message.

5 When the video tape is replayed, the operator indicates which lane is to be targeted for data to be displayed in the overlay. When a tape is replayed, the time, date, plaza i.d., etc. are recorded on the sound track of the video and are read into the microprocessor 82. The microprocessor 82 reads the time and searches the data file for messages that have the targeted lane identifier and the matching time and 10 date. When the messages are located, they are formatted and displayed in the data overlay. The time of the behavior in the picture now matches the display in the overlay.

15 Another situation where the AVETDM is necessary is where the POS system data is held until the end of the day or until the POS is closed. Neither way the transaction data is not available in real time. Consider a POS system that holds each transaction inside the POS terminal, and a host collects the held data only after the POS terminal is closed. The data is then stored in the POS system main 20 processor and is made available to the AVETDM via a set of magnetic disks. Time synchronization between the POS system and the AVETDM is achieved by a direct serial link between the POS system main processor and the AVETDM.

25 The AVETDM will record the video images (behavioral events) of the POS terminal activities but will not be able

to record any real time transaction data, as it has not yet
left the temporary storage in the POS terminal. Instead the
AVETDM records time and identity codes (synchronizing
indicia) on the video tape which can be retrieved during
5 playback. These codes will be used to synchronize the
transaction and event data received from the POS system with
the video images of the POS terminal. Messages coded on the
video tape can take the following form:

TIM yyyyymmdd hhmmss zz<EOM>

10 IDN aaaaaa bbbbbb cccccc zz<EOM>

where,

TIM is the message header for the time message

IDN is the message header for the identity message

15 yyyyymmdd is the date, with yyyy being the year, mm the
month, and dd the day

hhmmss is the time, with hh being the hours, mm the
minutes, and ss the seconds

~~zz is the message checksum~~

20 <EOM> is the end of message character, which in this
case is a line feed (0x0B)

aaaaaa is the customer identity code

bbbbbb is the site identity code

ccccc is an identity code used to identify different
systems within a site

The serial interface between the POS system main processor and the AVETDM uses the same time message format that is encoded on the tape. This message originates from the POS system main processor on a frequent periodic basis.

5 For example, many systems make the time and date available when the receipt is printed. The AVETDM receives the message, verifies the checksum, and makes any necessary adjustments to its internal clock. The AVETDM internal clock will thus be synchronized with the POS system clock.

10 The AVETDM will use its internal clock to generate the time messages that are encoded on the tape.

The transaction and event data files consist of individual records detailing each transaction or event. Each of these records must contain a time stamp to allow

15 them to be synchronized with the video stamp and therefore to be synchronized with the video tape. The playback system reads the data file before the tape begins to play. It extracts time data and other identifiers from the message and compares these with the information initially received

20 from the tape as it begins to play. This information will verify that the tape is in fact the one recorded for this particular data. As the tape plays the operator is given details on each transaction at the appropriate time.

The entire transaction data can be loaded into memory

25 before the behavioral recording is replayed. The stored transaction data can then be manipulated by the computer to

provide summaries, averages, counts, statistics, anomalies or exceptions. The desired information or anomalies can then be inserted during the replay of the behavioral transaction at the relevant times or sequences. The system can "look into the future" and display a warning message to the operator that a particular anomaly or transaction will occur in X number of frames or in X number of minutes. A control program can be customized to each user to look for particular events and to support this level of operation. Thereby allowing the operator to see transaction data derived from past, present and future behavioral events while viewing the "present" provided by the video tape replay.

An added benefit of the AVETDM system is that because the data is known in advance, the system can warn the operator before items of interest appear on the tape. The general format of the transaction and event data records is as follows:

TRN yyyyymmdd hhmmss tttttttttt....tttt zz<NL>

The specific details of the transaction record such as type of sale, amount, specific details about the items purchased, etc... are not important to the description of the AVETDM system and are simply represented as a series of t's above. The AVETDM will process these specific details in order to extract the information that is to be displayed to the AVETDM system operator.

The transaction record must contain a means for synchronizing the transaction data with the behavioral events recorded on the video tape. The preferred method is to time stamp the transaction data and the recorded behavioral events which allows video and data synchronization. However, other methods of synchronizing may be used. For example, pictorial or graphic recordings may be used. The transaction data system buffers some number of transactions before transmitting to a host computer. If four transactions are buffered, the first transaction is transmitted from the local buffer when the fifth transaction is consummated, the second transaction is sent after the sixth transaction is consummated and so forth. In these instances, the AVETDM can receive the signal that a transaction is being sent and can mark the tape with sequence codes. When the data for the first transaction is sent, the code written on the behavioral recording matches the behavior that coincides with the fifth transaction and so on.

Additional identification details (such as store and customer) might be contained in each transaction record or might appear in a special file identity and description block at the beginning of the file. Either way the correlation between the file and tape can easily be verified.

Another typical situation where the AVETDM is necessary is one where the POS system data is not available in real time, but is available at a slightly later time.

5 Consider a POS system which does not have its own internal clock or does not produce appropriate synchronizing indicia. Again, this example will use a POS system which holds each transaction inside the POS terminal, and collects the held data only after the POS terminal is closed. The data is then stored in the POS system main processor and is
10 made available to the AVETDM via a set of magnetic disks. Time synchronization between the POS system and the AVETDM is achieved via a time signal receiver. Both the POS system and the AVETDM will connect to time receivers that receive a broadcast time synchronization signal such as the one
15 transmitted by the NIST on WWV and WWVH. (See, for example, Figs. 9, 10 and 11.)

20 The AVETDM will record the video images of the POS terminal activities but will not be able to record any real time event and transaction data, as it has not yet left the temporary storage in the POS terminal. Instead the AVETDM records time and identity codes on the video tape that can be retrieved from the POS system with the video images of the POS terminal. Messages coded on the video tape can take the following form:

25 TIM yyyyymmdd hhmmss zz<EOM>

IDN aaaaaa bbbbbb cccccc zz<EOM>

where,

TIM is the message header for the time message

IDN is the message header for the identity message

5 yyyymmdd is the date, with yyyy being the year, mm the month, and dd the day

 hhmmss is the time, with hh being the hours, mm the minutes, and ss the seconds

~~zzz is the message checksum~~

10 <EOM> is the end of message character which in this case is a line feed (0x0B)

 aaaaaa is the customer identity code

 bbbbbb is the site identity code

15 cccccc is an identity code used to identify different systems within a site

 The serial interfaces with the time signal receiver use the same time message format that is encoded on the tape. This message originates from the time signal receiver on a frequent periodic basis. The AVETDM and POS system receive the message, verify the checksum, and make any necessary adjustments to their internal clocks. The AVETDM internal clock will thus be synchronized with the POS system clock. The AVETDM will use its internal clock to generate the time messages that are encoded on the tape and the POS system will use its clock to timestamp all transaction and event records.

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The transaction and event data files consist of individual records detailing each transaction or event. Each of these records must contain a time stamp to allow them to be synchronized with the video tape. The playback system reads the data file before the tape begins to play. It extracts time data and other identifiers from the message and compares these with the information initially received from the tape as it begins to play. This information will verify that the tape is in fact the one recorded for this particular data. As the tape plays the operator is given detail on each transaction at the appropriate time.